CLAIM(S)

What is claimed is :

1. A process for dyeing a fiber comprising a synthetic polymer selected from the group consisting of segmented polyurethanes, segmented polyurethaneureas, segmented polyetheresters, polyesters, polyamides, and poly(meta-phenylene isophthalamide), comprising the steps of:

   (a) preparing a vat acid dye by:
      (i) reducing a vat dye with a first reducing agent in water in presence of a surfactant at an alkaline pH; and
      (ii) lowering the pH by the addition of a carboxylic acid;
   (b) forming a dyebath by combining:
      (i) said vat acid dye;
      (ii) an aqueous solution of a carboxylic acid having a pH of about 5.2-6.5; and
      (iii) a second reducing agent in an amount sufficient to maintain said dye in a reduced state, wherein said second reducing agent comprises at least about 20 mole%, based on the total of said second reducing agent, of a compound selected from the group consisting of α-hydroxyalkyl-sulfinic acids having 1-6 carbon atoms, water soluble salts thereof, 1,2,4-trithiolane and mixtures thereof;
   (c) contacting said fiber with said dyebath and heating to at least about 95°C for a time sufficient to dye the fiber; and
   (d) oxidizing the dye in the fiber.

2. The process of claim 1 wherein the first reducing agent is selected from the group consisting of sodium dithionite, water-soluble salts of hydroxymethylsulfinic acid, and mixtures thereof and wherein said pH in step (b) is about 5.5-6.0.

3. The process of claim 1 wherein the first reducing agent comprises sodium dithionite and the second reducing agent comprises less than about 85 mole%, based on the total of said second reducing agent, of at least one water-soluble salt of an α-hydroxyalkylsulfinic acid.

4. The process of claim 1 wherein the carboxylic acid utilized in step (b)(ii) is selected from the group consisting of citric acid, formic acid and mixtures thereof, and the second reducing agent comprises the sodium salt of hydroxymethylsulfinic acid.

5. The process of claim 1 wherein the carboxylic acid utilized in step (a)(ii) is selected from the group consisting of carboxylic acids having 12-22 carbon atoms and mixtures thereof so that the vat acid dye is in a solid mixture, and the carboxylic acid utilized in step (b)(ii) is selected from the group consisting of acetic acid, formic acid, citric acid, lactic acid, and mixtures thereof.

6. The process of claim 1 wherein step (d) is carried out by adding sufficient oxidant to the dyebath to oxidize both the dye in the fiber and any unutilized reducing agent in the dyebath.

7. The process of claim 1 wherein a further step of reduction clearing the synthetic fiber by cooling the dyebath to no higher than about 95°C and adding sufficient base to raise the pH to at least about 10 [step (c)(i)], is carried out between steps (c) and (d).

8. The process of claim 7 wherein the synthetic fiber is blended with a cellulosic fiber, and a further step, of adding an alkaline vat dye and adjusting the dyebath temperature to at least about 60°C so that the cellulosic fiber is dyed, is carried out between steps (c)(i) and (d).

9. The process of claim 8 wherein the cellulosic fiber is cotton, the first reducing agent comprises sodium dithionite, the second reducing agent comprises less than about 85 mole%, based on the total second reducing agent, of at least one water soluble salt of an α-hydroxysulfinic acid, and the carboxylic acid utilized in step (b)(ii) is selected from the group consisting of acetic acid, citric acid, lactic acid, formic acid, and mixtures thereof.

10. A process for dyeing a fiber comprising a synthetic polymer selected from the group consisting of segmented polyurethanes,

segmented polyurethaneureas, and segmented polyetheresters, comprising the steps of:

(a) preparing a vat acid dye by:

(i) reducing a vat dye with a first reducing agent in water in presence of a surfactant at an alkaline pH; and

(ii) lowering the pH by the addition of a carboxylic acid;

(b) forming a dyebath by combining:

(i) said vat acid dye;

(ii) an aqueous solution of a carboxylic acid having a pH of about 4.0-6.9; and

(iii) a second reducing agent in an amount sufficient to maintain said dye in a reduced state, wherein said second reducing agent comprises at least about 20 mole%, based on the total of said second reducing agent, of a compound selected from the group consisting of *α*-hydroxyalkyl-sulfinic acids having 1-6 carbon atoms, water soluble salts thereof, 1,2,4-trithiolane and mixtures thereof;

(c) contacting said fiber with said dyebath and heating to at least about 95°C for a time sufficient to dye the fiber; and

(d) oxiding the dye in the fiber.

11. The process of claim 10 wherein the polymer is a segmented polyurethaneurea, the second reducing agent comprises less than about 85 mole%, based on the total of said second reducing agent, of at least one water-soluble salt of an α-hydroxyalkylsulfinic acid, and the dyebath has a pH of about 5.2-6.5.

12. A solid mixture comprising at least one vat acid dye, at least one carboxylic acid comprising 12-22 carbon atoms, at least one reducing agent selected from the group consisting of sodium dithionite, α-hydroxyalkylsulfinic acids comprising 1-6 carbon atoms, water-soluble salts of such acids, sodium dithionite, 1,2,4-trithiolane, and mixtures thereof, and at least one surfactant.

13. The mixture of claim 12 wherein the carboxylic acid comprises 16-20 carbon atoms, and the surfactant is anionic.